The physiology of tendrils.

Our knowledge concerning the irritability of tendrils has been considerably enlarged by Dr. Carl Correns.[1]

He finds that when the temperature surrounding tendrils is either suddenly raised or suddenly lowered between sufficiently separated extremes, a reaction, in all its phenomena like that released by a contact stimulus, is found to follow. The change, as such, affords the stimulus.

When the entire tendril is exposed to the same temperature conditions, it begins to roll in at the tip, continuing, if the temperature change be great enough, until several coils are formed. When the temperature is again brought to the normal, an unrolling of the tendril follows until it reaches again its original form. Or, if the new temperature limit is not so high as to produce a loss of sensitiveness, the tendril gradually accommodates itself to the new conditions when they are maintained, and uncoils. All the essential features of a typical reaction are to be observed.

The minimum temperature difference necessary to cause a perceptible reaction is, in case the experiments are conducted in the air, 10°C.; when tendrils are immersed in water, 7–8°C. If the change of temperature is gradually made, no reaction is seen to follow.

When the tendril is warmed locally, the reaction to the temperature change begins at the warmed place.

Tendrils are found to bend in a plane fixed for each tendril by its physiologically bilateral structure; hence whether warmed from any one side or placed so that all sides are warmed alike, the curvature always takes place in a particular predetermined plane. No tendrils observed were found to be physiologically radial.

The author decides that as far as he can discover, tendrils do not obey Weber's law concerning the relation of stimulus to reaction.

In regard to the method by which the organ carries out the various curvatures found, the author agrees with Pfeffer in referring it to variation of turgor pressure.

As was noted in the April GAZETTE, MacDougal, in 1892, observed that a temperature elevation to 40°C. causes a curvature of the whole tendril and local warming produces a local bending. He says, "the results from these high and low tem-

[1]Bot. Zeit. **54:** 1–20. 1896.

perature stimuli are doubtless due to their direct influence on the osmotic action of the cells." [2]

Correns finds that the most various kinds of solutions, so dilute as to cause no injury, call forth in tendrils a typical reaction. Since the cuticle is with difficulty penetrated, rather strong solutions are sometimes necessary to cause the reaction, e. g., iodine solution, 0.00192 %. Even stronger concentrations of other substances cause no injury and call forth the reaction, e. g., acetic acid, 2–6 %; arsenic, 1 %; chloroform, 10 %. Ammonia vapors also cause a plain reaction.

MacDougal found that when tendrils were submersed in solutions of the ordinary metallic salts (no concentrations given), "the induced osmotic action quickly caused curves." Unless penetrated and killed immediately, the tendrils were thrown into coils. [3]

In the case of the chemical stimulus Correns finds that accommodation takes place when the concentration of the solution is gradually increased.

A few experiments with induction currents renders it probable that they too are able to produce reactions similar to those described.

Correns studied the tendrils of Cucurbitaceæ and Passifloræ mainly, but other tendril-bearing forms were not neglected.—RODNEY H. TRUE.

The physiology of Drosera rotundifolia.

In his work on *Drosera rotundifolia*, Darwin[4] arrived at the conclusion that the speed with which the tentacles show curvature reactions varies according to the temperature, from 48.8°C. to 51.6°C. being especially favorable.

Dr. Carl Correns[5] regards this conclusion, that a temperature elevation releases irritation movements, to be worthy of further attention since phenomena of this kind are not of common occurrence. When leaves were cut from the plant and placed in distilled water which was brought to the desired temperature, his results agreed with those of Darwin obtained by the same method. When entire plants in the atmosphere were subjected to a rapid or a gradual elevation of the tem-

[2] BOT. GAZ. **18**: 125. 1893. [3] BOT. GAZ. **17**: 207. 1892.

[4] Darwin. Insectivorous Plants 66. 1875. [Ed. I.]

[5] Carl Correns, Bot. Zeit. **54**: 21–26. 1896.